POCKET COMPUTER NEWSLETTER

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PROGRAM CODES AND DECODES MESSAGES FOR PRIVACY

This program converts the Radio Shack TRS-80 or Sharp PC-1211 PC into a sophisticated pocket coder! Messages can be encoded and decoded using a personalized keyword (secret code).

Only letters of the alphabet may be encoded. Characters in a message are input one character at a time. A period (decimal point) is used to signify the end of a message. Do not code spaces. Leave them out of messages. They are generally quite easy to place as a message is decoded by the receiver.

The ability to "lock" and "unlock" a message is controlled by a keyword. The key used by this program can be up to 30 characters in length. This allows more than 2.5 to the thirty-eighth power possible key variations. With such a large number of keys, the message becomes quite difficult to break.

The key is specified at the start of operations to either encode or decode a message. To prevent unauthorized use, the key is erased from memory at the conclusion of either type of operation.

A message to be coded or decoded can be of any length. The coder/decoder is quite rapid in operation, taking only a second or so to cipher or decipher each character.

Some people may want to save keystrokes by replacing the PRINT statements in lines 85 and 120 with PAUSE statements. If this is done, you have to pay close attention to the display and write down the output as soon as it appears. However, you won't have to hit the ENTER key after each display. Instead, the program will be ready for the inputting of the next character.

A Few Tests

Here are a few examples of the program's operation that you can use to make sure that the program is loaded properly.

```
KEYWORD:   SECRET.
MESSAGE:   POCKETCOMPUTERNEWSLETTER.
CIPHER:    RCOLSWECYQIWGFZFKVNSFUSU
```

Now, reverse the process to see that you get back the right message:

```
KEYWORD:   SECRET.
CIPHER:    RCOLSWECYQIWGFZFKVNSFUSU.
MESSAGE:   POCKETCOMPUTERNEWSLETTER
```

Here is the same message encoded using a different, longer keyword:

```
KEYWORD    ABNFLWNBDAVWLYCLTXELWWLY.
MESSAGE    POCKETCOMPUTERNEWSLETTER.
CIPHER     ZZZZZZZZZZZZZZZZZZZZZZZZZ
```

Can you imagine someone trying to decode a string of Zs without having the key? To check your unit, put the keyword back in, key in the string of Zs, and see that you get the proper message:

```
KEYWORD    ABNFLWNBDAVWLYCLTXELWWLY.
CIPHER     ZZZZZZZZZZZZZZZZZZZZZZZZZ.
MESSAGE    POCKETCOMPUTERNEWSLETTER
```

When you are sure that you have keyed in the program properly by performing the above tests, you are ready to put it to use. Just make sure the recipient of your messages has a PC, a copy of the program and the correct keyword. Otherwise, they are going to have a difficult time figuring out what on earth you are talking about!

Note that the essence of this method is in the *keyword.* A person can have a PC and the program, but still be essentially unable to decode a message unless the keyword is known. So, be sure you appropriately safeguard the keyword at all times!

Thanks for this rather novel application of a PC go to: *Emerich Auersbacher, 41 King Street – Apt. 2, Belleville, NJ 07109.*

Program *Message Coder/Decoder*

```
10  PAUSE "  INITIALIZING":FOR Z=1 TO 26:A(Z)=
    Z:NEXT Z
15  INPUT "CODE/DECODE? (C/D):";A$(53)
20  A$(27)="A":A$(28)="B":A$(29)="C":A$(30)=
    "D":A$(31)="E":A$(32)="F":A$(33)="G"
25  A$(34)="H":A$(35)="I":A$(36)="J":A$(37)="K"
    :A$(38)="L":A$(39)="M":A$(40)="N"
30  A$(41)="O":A$(42)="P":A$(43)="Q":A$(44)=
    "R":A$(45)="S":A$(46)="T":A$(47)="U"
35  A$(48)="V":A$(49)="W":A$(50)="X":A$(51)=
    "Y":A$(52)="Z"
40  BEEP 1:PAUSE "KEYWORD -->":A(55)=58
45  IF A(55) > 87 LET A(57)=A(55):GOTO 60
50  INPUT "LETTER:";A(54):IF A(54)=0 LET A(57)=
    A(55):GOTO 60
55  A(A(55))=A(54)-1:A(55)=A(55)+1:GOTO 45
60  IF A$(53)="D" THEN 90
65  BEEP 1:PAUSE "CODE -->":A(55)=57
70  INPUT "LETTER:";A(54):IF A(54)=0 PAUSE
    "END":CLEAR:END
75  A(55)=A(55)+1:IF A(55) > = A(57) LET A(55)=58
80  A(56)=A(A(55))+A(54)+9:A$(56)=A$(A(56)-26*
    INT(A(56)/26)+27)
85  PRINT "CODED LETTER:  ";A$(56):GOTO 70
90  BEEP 1:PAUSE "DECODE -->":A(55)=57
95  INPUT "LETTER:";A(54):IF A(54)=0 PAUSE
    "END":CLEAR:END
100 A(55)=A(55)+1:IF A(55) > = A(57) LET A(55)=58
105 A(56)=A(54)-A(A(55))-11
110 IF A(56) < 0 LET A(56)=A(56)+26:GOTO 110
115 A$(56)=A$(A(56)+27)
120 PRINT "DECODED LETTER:  ";A$(56):GOTO 95
```

PRODUCT REVIEW
THE PANASONIC HHC

Produced by: *Panasonic Company.*
List Price: *$600.00 (4K memory version).*
Availability: *Panasonic distributors.*
Reviewer: *David G. Motto, 3639 Roosevelt, Jackson, MI 49203.*

I received my Panasonic HHC in a very large box directly from the Panasonic Company. I was surprised at the weight of the box. I had only ordered the hand-held unit (4K memory version), the battery charger and the Microsoft BASIC cartridge. When I opened up the boxes I determined why they weighed so much. These units are *heavy!*

Maybe that is one reason that I feel that they are well made. This HHC feels like a good piece of machinery in the hand, somewhat like the feel of a good programmable calculator such as the Hewlett-Packard model 67 that I purchased some time ago.

The HHC is bigger than other "pocket computers." By no stretch of the imagination can it be considered pocket-sized. It has a keyboard with 65 keys arranged similar to a typewriter layout with the number keys on the top row. The keys repeat automatically if held down for more than about one-half a second. There are two shift keys. One for upper case and one for other functions.

The display is an 8 by 159 dot liquid-crystal display matrix. There are also seven annunciators that display the status of certain operations, such as if the SHIFT key has been pressed. An eighth annunciator may be activated by applications programs. The display can present up to 26 characters at a time.

The HHC comes equipped with an operating system installed that provides four initial operating modes. Each mode is selected from a main menu. One mode directs the unit to perform as a four-function calculator. Another turns it into a programmable alarm clock. A third provides a file system. The fourth permits the running of applications that reside in plug-in cartridges. Up to three cartridges will fit into the back of the unit at one time. The left side of the unit holds a special port that enables the unit to be connected to accessories.

The Panasonic HHC utilizes a 6502 microprocessor (the same type of CPU as that used in the Apple II, the OSI Challenger, the Commodore PET and other personal desktop computers) running at a clock rate of 1.3 Mhz. It is powered by rechargeable batteries.

Using the HHC

Pressing the digit "1" when the HHC is in the menu selection cycle brings up the calculator mode. In this mode, ten-digit values may be added, subtracted, multiplied and divided. There is a four-key memory and a percent key too.

Menu item number 2 provides a clock/controller package. A sub-menu allows a choice of clock functions. You can (1) set alarms, (2) review alarms, (3) acknowledge alarms, (4) display time or (5) set time. Time is displayed as: day (given as a three-letter abbreviation for the day of the week), hours, minutes, seconds, an AM or PM marker, and then the date. The date is shown as a three-letter mnemonic for the month, two digits for the day of the month and four digits for the year. You can use these capabilities in various ways. Need to find the day of the week for a future appointment? Just key in an alarm for that date.

Item number 3 on the main menu brings up a built-in file system. Many business people will like this system. It allows you to create a file of information, add to it, update it and then search it for a specific item. The sub-menu for this system starts with just two entries: New File and Copy File. The first option allows the creation of a new file name. Once entered, this name appears as the third item in the sub-menu! The Copy File option allows the duplication of an entire file.

Once a file has been named, entries of up to 80 characters per record may be made. A warning sounds when you come close to filling up the available memory space. When records are in memory, the search key may be used to find records containing a group of characters, such as a person's last name. You can, of course, list the records as desired.

The fourth menu option is called "Run SNAP programs." SNAP is an assembler-like language similar in construction to FORTH. This option allows such application programs to be executed. That is about all I can tell you about the option at this time.

The Menu Expands!

When I plugged the Microsoft BASIC cartridge into the back of the unit (which has thoughtfully been designed so that it will not go in the wrong way!), a fifth item suddenly appeared as an option on the main menu! Yes, it was: Microsoft BASIC. Now, when item 5 is selected, a sub-menu offers (1) New File and (2) . . . (N) – whatever file names you assign to BASIC programs! It is certainly nice to have the capability of storing several separate files with different programs, each using a favorite group of line numbers and designated by a descriptive name.

The fact that the BASIC provided was written by Microsoft means that it is closer to the BASIC used on many desktop computers than that provided on most other hand-held computers. That means there are more pre-written programs for this HHC available at this time than for other pocket computers.

There are some drawbacks to this language, though. Scientists and those in the technical disciplines may be disappointed to learn that there are no trigonometric functions provided, though the manuals list programs that can be used to calculate sine, cosine, tangent and similar functions.

The other features of this BASIC more than make up for this lack, in my opinion. The string handling capabilities are excellent and the ability to handle multi-dimensional arrays makes matrix handling comparatively easy. For instance, strings can be up to 255 characters in length and the string functions ASC, CHR$, LEN, LEFT$, MID$, RIGHT$, STR$ and VAL are supported.

Debugging of programs is facilitated by the TRACE mode and by meaningful two-letter error codes.

When the 4K machine is configured with one file for programs, no alarms set and a one-character program file name, it has 3,076 memory locations available for the storage of programs and data. That is enough room to store some fairly complex programs.

Execution is fast. A simple benchmark program in the form:

```
1 FOR I=1 TO 1000:NEXT I
```

appears to run more than 10 times as fast as the new Sharp PC-1500 pocket computer. *[Really? – N.W.]*

The Microsoft BASIC also includes the PEEK, POKE and CALL functions. Though explained in the manual, few concrete examples of their usage is provided. I suspect these functions may be the key to accessing each dot on the display or making music on the beeper. However, neither of these capabilities is expressly provided as part of the BASIC language. Other display possibilities, such as flashing or reversing displayed characters, are explained.

Accessories

A very necessary accessory, that must be purchased separately, is an adaptor/charger. It weighs two pounds complete with long cords that allow use of the HHC far from an electrical outlet.

The standard HHC comes with a brown padded case, a carrying strap and a plastic "whatzis." The latter item slips over the front or back of the unit, but its use is not explained. I gather it guards against coffee spills or unauthorized use.

The manual that accompanies the unit is friendly and easy to read. It is spiral-bound, has 60 pages and seems to also serve as a sneaky sales pitch by providing a set of instructions for the various accessories. Perhaps they considered it convenient to bind them all together, but I consider it devilishly clever.

The accessories for the unit include a video adaptor allowing the HHC to connect to a TV or video screen, an RS-232C adaptor for communication purposes, a 15-column thermal printer, an I/O expansion unit, an acoustic modem and memory modules. An 8K module is currently available and a number of these modules may be combined in a system.

The Bottom Line

This machine *feels good!* It can be equipped with a well-written BASIC language that executes quickly and has good string functions. Other languages will be available soon. The built-in features such as the file system are easy to use. The unit is expandable and many of the accessories are available *now!*

PRODUCT REVIEW
THE SHARP PC-1500

Produced by: *Sharp Electronics Corporation.*
List Price: *< $300.00*
Availability: *Sharp distributors.*
Reviewer: *David G. Motto, 3639 Roosevelt, Jackson, MI 49203.*

The new Sharp PC-1500 is not as big as the Panasonic HHC, but it is too large to fit into a shirt pocket.

The keyboard is typewriter-style with staggered keys. A numeric keypad is at the right of the alphabetical keys. The only keys that automatically repeat when held down (in the executive mode) are the cursor controls. These serve the same functions as those on the earlier PC-1211 unit.

The display consists of a 7 by 156 dot liquid-crystal matrix. In the executive or edit mode the display scrolls up to 80 characters across its 26-character width. In the "graphics" mode each dot on the display may be individually activated through a column-addressing technique. The display also has a number of annunciators that indicate the status of the machine.

The PC-1500 has several operating modes. The RUN mode is used to execute programs or perform calculations. The PRO (program) mode is used to create and edit programs. A RESERVE mode may be used to assign operations and functions to a set of six user-definable keys. Each such key may be assigned three different operations. Labels that appear on the display may be created to identify the function of each user-definable key. A key labeled RCL (recall) is used to bring up the key notations when desired. Another key is used to cycle between user-definable-key modes referred to as I, II and III that give those keys their versatility.

There is a 60-pin connector on the left side of the computer. A compartment into which additional memory may be plugged is provided in the back of the unit. Another compartment accessed from the back houses four size AA batteries that power the unit in portable operation. An a.c. adaptor (optional, not provided with the unit) may be plugged into the right side of the unit.

A special TIME function is provided by the computer. It holds the date and time in the numeric format: MMDDHH.mmss where MM represents the month, DD the day of the month, HH the hour, mm the minute and ss the second. The internal clock can be set by the user and then automatically maintains the correct time.

A programmable audio generator permits the playing of notes that may be varied in pitch and duration.

The BASIC language that is provided on this unit is a considerable upgrade from their earlier unit yet it is also upwards compatible. Programs written for the PC-1211 will run on the new PC-1500 as long as no tricks (such as implied multiplication) are attempted. However, there are some differences in the manner in which variables are handled. The PC-1500 has a separate memory area reserved for the single-character variables A through Z and the string variables A$ through Z$. You can now use both the variable A and A$ at the same time. The single character string variables A$ through Z$ are limited to sixteen characters maximum. (Other two-character string variables, such as AA$, can be dimensioned to hold up to 80 characters.) If you want to use the locations set aside for variables A – Z and A$ – Z$ as part of an array using subscripting, then the special symbol "@" is used along with the subscript. Thus, @(1) would be stored in the location assigned to variable A and @$(26) would correspond to Z$.

Two-character variables are stored in the user's memory area. One- or two-dimensional arrays (numeric or string) may be utilized.

This version of BASIC supports the string functions ASC, CHR$, LEFT$, MID$, RIGHT$, STR$, VAL and LEN. Strings can be compared on a character-by-character basis for equality or the greater than or less than (using the ASCII character code) condition.

New BASIC functions include AND, OR and NOT.

Program errors may be located by pressing the line scroll up key immediately after receipt of an error message. There is a TRACE mode that allows the operation of a program to be closely examined. For instance, the values of variables may be examined after the execution of each statement if desired. Error messages are coded as numbers. The nice feature of being able to go backwards in a program listing has been retained.

An INKEY$ statement allows keyboard entries (under program control) to be made without having to use the ENTER key.

Programmers will also like the built-in hexadecimal (up to 4 digits) conversion routine that translates to decimal values.

The PC-1500 is supplied with a black vinyl, padded carrying case and two manuals. The Instruction Manual is better written than previous ones, but it sometimes tends to be over-cute. The programs supplied in the Applications Manual are sometimes re-hashes of earlier ones. Many of the programs also require the use of the accessory printer/plotter and cassette interface and/or the 4K optional memory module.

An accompanying program presents the time of day each time the PC-1500 is turned on. It demonstrates some of the new string handling statements available on this PC.

A second short program, for those that may already have a PC-1500, is based on graphics produced by *Michael Lamping*. It demonstrates simple animation and sound effects.

```
10:ARUN :WAIT 50:
   A=TIME :A=A-10
   0*INT (A/100)
20:D$="AM":B$=
   STR$ (INT A-12
   *(INT A>12)+12
   *(INT A=0)):IF
   A>=12LET D$="P
   M"
30:C$=LEFT$ (MID$
   (STR$ (A-INT A
   ), 3, 2)+"00", 2)
40:CURSOR 9:PRINT
   B$+":"+C$+" "+
   D$:CLEAR
```

Time Program
This routine, when placed as the first program in memory, will automatically display the current time for a brief period whenever the PC-1500 is turned on. Notice the ARUN statement in line 10 which is the key to this automatic power-on operation.

Animated Runner Program
As an example of the type of animated graphics that can be executed on the PC-1500, this routine presents a surprisingly smooth animated display of a man running across the screen, complete with sound effects. If you want to study how the artist achieved the fluidity, slow the routine down by changing the WAIT statement in line 10 to read WAIT 100.

```
10:WAIT 03:CLS
20:FOR A=0TO 140
   STEP 6
40:GCURSOR A:
   GPRINT "000048
   241E0F2E1C02"
60:GCURSOR A+1:
   GPRINT "002020
   2C1E0F0E0C32"
80:GCURSOR A+2:
   GPRINT "000010
   241E0F0E7404"
100:GCURSOR A+3:
   GPRINT "000020
   203E0F4E3400":
   BEEP 1, 5, 5
120:GCURSOR A+4:
   GPRINT "000000
   002E7F3E0000"
140:GCURSOR A+5:
   GPRINT "000000
   4C3E0F2E3400"
160:NEXT A:GPRINT
   "0000000000000
   00000"
180:GOTO 20
```

PRODUCT REVIEW
SHARP CE-150 PRINTER/PLOTTER & CASSETTE INTERFACE

Produced by: *Sharp Electronics Corporation.*
List Price: < *$250.00*
Availability: *Sharp distributors.*
Reviewer: *Nat Wadsworth, Editor.*

Clever! That is the first impression I had when starting to examine and exercise the Sharp CE-150.

The printing mechanism on this machine is unique to say the least. A plastic cylinder is notched along its axis to hold four miniature ball-point pens at intervals of 90 degrees around its circumference. These pens are about one inch in length, slightly less than 1/4 inch thick in the barrel portion, and are supplied in four colors. When installed on the plastic cylinder the pens look similar to bullets mounted in a revolver.

The tip of each pen fits through a delicate metal membrane that serves to hold the point firmly while also acting as a return spring. When resting, the pens are positioned a fraction of an inch away from the writing surface of the paper. However, when a pen is positioned at the top of the plastic cylinder (or drum, if you prefer), the back of the pen is contacted by a small lever or hammer. This lever presses the pen forward whenever printing or drawing takes place. When the lever is not activated, the thin metal membrane at the tip of the pen pushes the pen back to its resting (non-writing) position.

The paper-feeding portion of this unit is also somewhat unique. As the paper passes around the main printing platten it is gripped tightly on each side by sprockets. The points of these sprockets actually leave tiny pin-prick marks along the sides of the paper about 1/16 of an inch from the edges. This gripping method enables the paper to be advanced or *backed up* a considerable distance (to a maximum of 10 centimeters). Thus, the paper is manipulated as it would be in a drum plotter.

The pen(s) move horizontally across the width of paper and the paper can be moved forwards or backwards. When you combine the two directions of motion you have the operation of the new CE-150 printer/plotter. It is quite a sight to see in operation, especially when printing text. This is because every character is actually drawn as a series of line segments. Drawing a character such as the letter "X" requires simultaneous movement of the paper and pen. The movement of both items if quite rapid and it is further synchronized with appropriate "pen down" and "pen up" commands. The net effect is a jittering motion of both the paper and pen and a rapid (but soft) pitter-patter sound as the pen strikes the paper. But, behold, the message does appear!

I was, frankly, surprised at the precision with which characters are drawn. An accompanying example shows the print sizes that can be produced by the unit when in the text mode. Character sizes are simply chosen using the CSIZE command. The directive CSIZE 1 yields tiny writing that I find useful for archive listings. CSIZE 2 is the size (second line in the example) normally used for producing program listings. CSIZE 9 produces characters that are close to 1/2 inch high.

Basic Capabilities

The unit can be checked out at any time by issuing the TEST directive. This causes a self-test procedure to be executed. As this is done the unit draws a series of four boxes, one using each pen color.

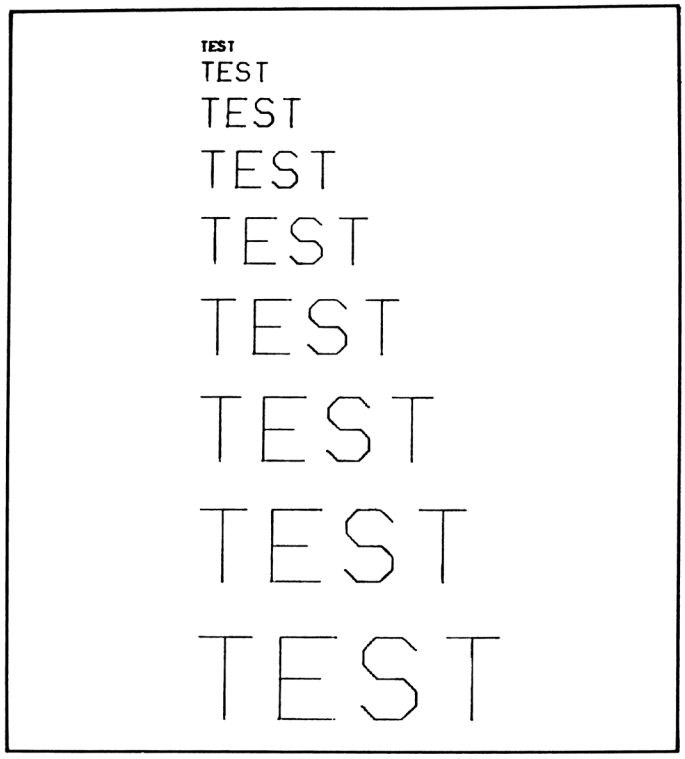
A switch on the front of the unit may be set by the operator to cause the printing of manual calculations or to only activate the unit under software (program) control.

The PC-1500 must be mounted on and hence plugged into the CE-150 when in operation. Rechargeable batteries power both the printer and the computer when so combined.

The CE-150 has two fundamental modes of operation. The TEXT mode is normally used for printing characters. Text can be printed in four directions: normal (left-to-right), inverted (right-to-left), and vertically (either from bottom-to-top or vice-versa). The ROTATE directive is used to select the direction in which text printing is to proceed.

The LPRINT command along with the USING, TAB, LCURSOR, CSIZE, COLOR and LF directives is used to output text characters under program control. The LPRINT directive is similar in capability to the PRINT command that controls the PC's liquid-crystal display (LCD), but with extended capabilities through the use of the various supplemental commands.

Sample *CE-150 in TEXT Mode.*



To obtain program listings the LLIST command is utilized. This directive allows single lines, groups of lines or the entire contents of memory to be printed. Lines to be printed can be specified by line number or through the use of program labels.

You can obtain listings in the color of your choice by selecting a particular pen color prior to using the LLIST directive. This can be particularly useful in keeping listings in chronological order as a program is developed and upgraded.

An interesting capability of this unit is that a line feed (LF) command permits paper to be moved forwards or *backwards!* (There is, however, a limitation on how far you can back the paper. The maximum is about 10 centimeters which corresponds to approximately 24 lines when printing characters of size 18 to a line.)

Graphics Features

A group of commands when the unit is in the GRAPH mode enables the device to operate as a plotter.

An "origin" for graphic operations may be set using the "set origin" (SORGN) command. Once established, future pen moves in this mode are referenced to this position.

The GLCURSOR directive moves the pen to an X–Y coordinate without drawing a line (pen up).

The LINE statement enables the plotter to draw a line between two (or more) X–Y coordinates, using a specified type of line and pen color. The type of line possible ranges from a solid line through a series of dotted and dashed lines. A special variation of this instruction permits a box, square or rectangular, to automatically be drawn. All that is required are the coordinates of the diagonal across the box. Multi-segment lines are drawn by giving a series of X–Y coordinates in a single statement.

The RLINE directive is identical to the LINE statement except that X–Y coordinates are relative the current pen position rather than a previously set origin.

Pens Require Care

The 20 page instruction pamphlet is careful to warn the user to remove the pens from the unit when the system is not in use. The ink in the pens seems to be thinner than that of ordinary ballpoint writers and can apparently dry out at the tip fairly rapidly if the pens are not capped. After several weeks of operation I have not experienced any difficulty if each pen receives use on a daily basis. However, upon returning from a five day trip with the pens left uncapped in the unit, I found one of the pens would no longer write. Indeed, the tip had dried out just as the manual had warned. Fortunately, I found that the pen was rejuvenated by placing a drop of water in its storage cap and allowing the piece to rest for a day.

Removing/remounting the set of pens takes a minute or two. This can be a little annoying if you are used to "instant-on" appliances. But, my experience indicates you should heed the manual's advice and place the pens back in their storage capsules if you will not be using them for a period of several days.

Paper

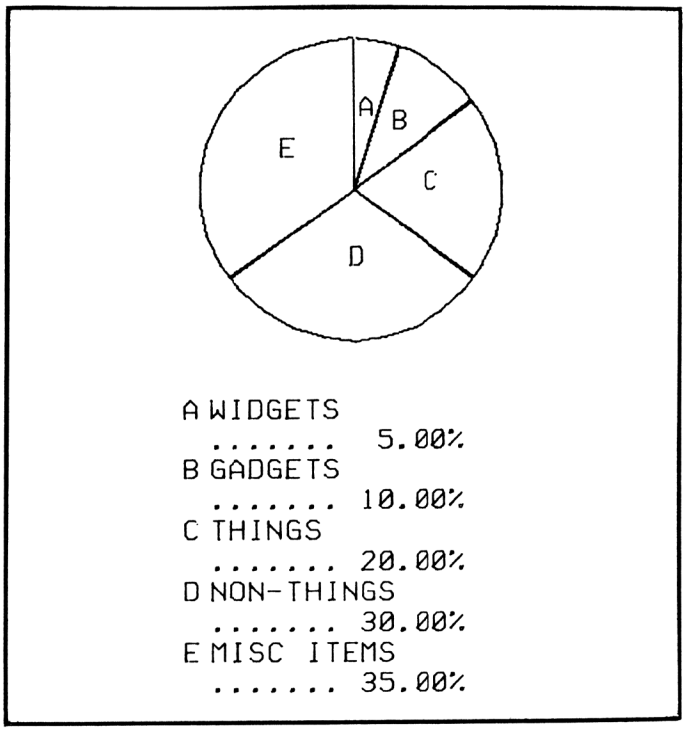
The paper used in the machine appears to be ordinary 2-1/4 inch wide adding- or calculator-machine tape. I have been replenishing the small inch-and-a-quarter diameter rolls supplied with the unit by winding such tape on the exhausted spools. Be sure to save the spools from the initial paper supply that comes with the unit if you plan to economize likewise. The spools are specially sized to accept a shaft that holds a spool in position and enables it to feed paper smoothly to the printer/plotter.

Summary

This appears to be a precision unit with remarkable printing capability considering its moderate price. I am initially intrigued and favorably impressed. Time will now tell if it maintains its precision under daily use.

Oh yes, the unit includes a tape cassette interface that can control two separate tape units. Its operation is straightforward and has a few features that make it a little snazzier than its predecessor, the CE-121/CE-122. For instance, it tells you the name(s) of the file(s) as it finds and loads them from tape!

Sample *CE-150 Showing Both GRAPH and TEXT Modes.*



PRODUCT REVIEW
ELECTRICAL ENGINEERING I

Produced by: *Radio Shack for the TRS-80 Pocket Computer.*
List Price: *$24.95*
Availability: *Radio Shack Computer Centers and selected Radio Shack stores.*
Reviewer: *Norlin Rober, 407 North 1st Avenue, Marshalltown, IA 50158.*

COMPLEX, the first of the six programs in the package, converts the PC to a complex-number calculator that uses reverse-polish notation.

I have some good news and some bad news.

The good news first: Radio shack has crammed a large number of operations and functions into this program. A nicely labeled keyboard template is provided to facilitate easy location of the appropriate user-defined keys. In addition to the four arithmetic operations, the operations X^Y and LOG X to base Y are provided. The programmed functions of complex numbers include 1/X, LN, e^X, SIN, COS, TAN, ASN, ACS, and ATN as well as conversions between rectangular and polar forms. Following any calculation, the real and imaginary parts of the resulting complex number appear in the display.

The reverse-polish notation, familiar to users of Hewlett-Packard calculators, operates with a stack of twelve complex-number registers. (In the reverse-polish system, an operation on a pair of numbers requires first entering the pair, then specifying the operation to be performed.) The variable I is used as a pointer to indicate the location of the next-available stack position. There are "bells and whistles" to warn the user when the stack is depleted or overfilled.

The effect of the sequence SHIFT/SPC is determined by what has been entered into the display – a rather ingenious way of (in effect) extending the number of user-defined keys. If I is first put into the display, SHIFT/SPC will initialize the calculator by clearing the stack. With C displayed, the top of the stack is copied into the next stack level, making it convenient to multiply a complex number by itself without having to re-enter it. If P is displayed, the top of the stack is "pulled," that is, it is removed from the stack and displayed. This is useful in making corrections. Finally, if the display is blank, prompts for entering inputs into the stack will appear.

Fitting all of this into the available memory of the PC required heavy reliance on the use of subroutines. As a consequence, execution is slowed to some extent because of the search time needed for subroutine calls.

Now for the bad news. The subroutine used for rectangular-to-polar conversion produces incorrect results whenever the complex number used as input contains a negative real part. To make matters worse, this subroutine is also used by LN, X^Y and LOG X to base Y. There is still more bad news. The routines for ASN, ACS and ATN (in some cases) give wrong answers!

Here are some examples: -1 + 0j is converted to the polar form $r = 1$, $\theta = 0$. LN(-1 + 0j) is given as zero and (-1)^3 is given as 1. Although ATN($-\sqrt{3}$) equals $-\pi/3$, it is given as $2\pi/3$. ASN(0 - 1j) should be 0 - .881373587j, but the program calculates the value as 0 + .881373587j. These are not isolated examples of special cases giving incorrect results.

It is really a shame that such an otherwise well-thought-out program should be ruined because of incorrect algorithms. Anyone buying this package should plan on correcting the mistakes in it before putting it to productive use.

[Norlin has provided the necessary "fixes" – see the recommended corrections at the conclusion of this review. – N.W.]

The second program in the package, IMPCALC, is designed to perform impedance calculations. It determines the effective complex impedance of a network containing inductances, capacitances and resistances combined in series and parallel circuits. This program, which is only 606 bytes long, appears to be free of errors.

Program AMPDES determires the bias resistances and bias voltage for a transistor amplifier circuit. The instruction manual includes a diagram of the circuit modeled. A nice feature of this program is that the calculated resistor values are rounded to the nearest standard values. Thus, a resistance calculated as 35,800 ohms will be rounded to the

standard 33,000 ohm value (when 10% tolerance is specified). Although the instruction manual does not mention it, SHIFT/B can be used to re-display the calculated results. Another routine in the program provides the capability to determine the required heat sink transfer characteristic. The SHIFT/SPC key sequence provides a program menu.

SIMEQ is a program designed to solve a system of up to seven simultaneous equations. It is possible to display the entire matrix, one element at a time, after it has been entered. If used with a printer, a permanent record may be obtained. When the matrix is reviewed, the opportunity to correct the displayed entry is provided. This is a nice feature. It is also possible to change a specific entry without going through the entire matrix. This is accomplished by keying SHIFT/F and indicating the desired row and column when prompted.

However, a price must be paid for all this convenience. The program is so long that a system of seven equations is the largest system solvable within remaining memory. Execution is slow. A system of six equations takes about 3-1/2 minutes to solve. The speed could have been essentially doubled if less subroutine calls had been used. There also appears to be a minor error in this program. When the prompt asks for the order of the system, it will not accept an input of 2 even though the program is capable of solving such a system. When the order 8 is specified, it is accepted and the program proceeds to give an incorrect solution, instead of warning the user that the program's capabilities have been exceeded.

[Norlin has also provided a cure for this problem! – N.W.]

The next program, FILTERS, calculates the values for inductances and capacitances in derived highpass and lowpass filters. Input parameters are the cutoff frequency, maximum attenuation frequency and termination resistance. Active lowpass, highpass and bandpass filter circuits may also be designed. The computer determines the appropriate resistor and capacitor values from relevant inputs. The manual includes circuit diagrams for each of the filters covered, identifying the components specified as parameters.

The last program in the package is named TABLES. It may be used to determine (1) the resistance, per foot of copper wire at a given wire gauge; (2) the wire size needed to carry a specified current; (3) the value and tolerance of a color-coded resistor; (4) the value and tolerance of a color-coded capacitor; and (5) the number of turns of wire needed to make a RF coil having a specific inductance (in microhenries) at a given coil diameter and gauge of wire.

The routines that translate color codes allow either "grey" or "gray" as well as "purple" or "violet." However, the practicality of these programs is questionable. It seems that one could get results a lot faster consulting a chart rather than spending the time required to spell out the individual colors (to say nothing about the time needed to load the program from the cassette)!

There does appear to be a good deal of useful material in the package. It is unfortunate that the complex number calculator contains a number of bugs.

Bug Fixes

[PCN asked Radio Shack to comment on Norlin's findings. While expressing immediate concern, a Radio Shack representative was not able to provide a definitive corrective response as of press time. However, the following modifications to the Electrical Engineering I *package are said to eliminate the bugs discovered in the review. These are the alterations suggested by the program's reviewer,* Norlin Rober.*]*

Listing *Correction to SIMEQ Program.*

The program *SIMEQ* can be corrected to accept a 2nd order system and reject 8th order by replacing line 22 with the following:

```
22 "A" INPUT "ORDER?";A:B=A:IF (A < 2) + (A > 7)
   GOTO 22
```

Listing *Corrections to COMPLEX Program.*

The program *COMPLEX* requires considerable alteration to fix. If the original line numbers 25, 26, 28 and 39 are simply modified to eliminate wrong answers, then the program becomes so long that there is not enough memory left to hold a 12-register stack. However, it is possible to economize in other sections of the program in order to pick up some room in memory. The alterations settled upon include modifications to lines 25 – 28 and 39 – 44 as shown in the following listing:

```
25 "X" GOSUB 44:A=ASN E:I=I+2:GOTO 19
26 "C" GOSUB 44:A=ACS E:B=-B:I=I+2:GOTO 19
27 "V" C=AA+BB+2B+1:C=.25*LN(C/(C-4B
28 G=A:B=1-AA-BB+E-90:A=ATN(2A/B)/2+(B<0)*π/2*
   (SGN G+(G=0

39 G=√(AA+BB):B=SGN A*ASN(B/G)+(A<0)π*(SGN B+
   (B=0:A=G:RETURN
40 A=EXP A
41 B=E*SIN B:A=A*COS B:RETURN
42 F=EXP B:G=(F+1/F)/2:H=G-1/F:B=H*COS A:A=G*
   SIN A:RETURN
43 F=EXP B:G=(F+1/F)/2:H=G-1/F:B=-H*SIN A:A=G*
   COS A:RETURN
44 D=AA+2A+1+BB:G=√(D-4A):D=(√D+G)/2:E=D-G:
   B=LN(D+√(DD-1))*(SGN B+(B=0:RETURN
```

PRODUCT REVIEW
PROBLEM-SOLVING ON THE TRS-80 POCKET COMPUTER

Authors: *Don Inman and Jim Conlan*
Publisher: *John Wiley & Sons, Inc.*
List Price: *$8.95*
Reviewer: *Nat Wadsworth, Editor*

The authors of this book are associated with Dymax Corporation, a firm that has long been active in the personal computing educational field. This book is intended to educate first-time users in the operation and application of the Radio Shack TRS-80 Pocket Computer. This it will certainly do – and in a friendly and uplifting manner.

The 240+ page book is divided into 12 chapters plus 5 appendices. The chapters provide an overview of the computer itself, and then get right into teaching different capabilities of the little machine through a variety of practical application examples. There are sections dealing with data files, trigonometric functions, logic functions, random numbers, interest calculations, storing, sorting and searching, chaining programs together and using the optional printer unit.

The style is tutorial, friendly yet not condescending. There are lots of tables, charts and walk-through sequences – where each input and the expected display results are illustrated. A considerable number of practice examples are included whereby you are asked to fill in your own version of a program. The book then illustrates a suggested method of approaching the problem. There are additional self-test problems at the end of chapters, along with the answers or results one should obtain when a solution has been properly programmed.

The publishers of the book have declared it to be part of their STG ("Self-Teaching Guide) series. This it certainly appears to be. If you are a beginner to the use of PCs, I think you would enjoy this volume. At 240+ pages it is still slim enough (just 1/2-inch thick) to fit in your briefcase for ready reference or study in spare moments.

ELECTRONIC FILTER PROGRAM FOR THE CASIO FX-702P

This program determines the required filter order and component values to use in Butterworth or Chebyshev lowpass and highpass filters. An accompanying diagram indicates the circuit forms and positions of calculated components. The program only calculates odd order filters in order to maintain equal input/output impedances.

Mnemonic prompts used in the program are defined as follows:

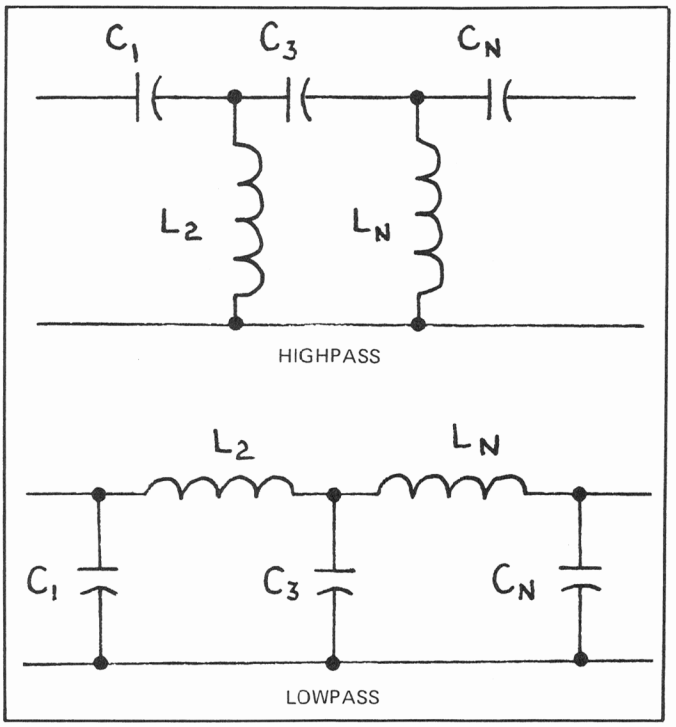
R-IN	=	Filter input/output impedance in ohms.
END-F	=	Filter passband end frequency (ripple bandwidth).
REJ-F	=	Rejection frequency (determines filter slope/order).
REJ-LOSS	=	Attenuation in DB at rejection frequency.
RPL	=	Ripple in DB of Chebyshev filter.
N	=	Filter order.
3DB-F	=	Butterworth passband end frequency.

Sample Run

Check for proper loading of the program using the following example:

```
BUTWTH OR CHEB? C
HI OR LOWPASS? L
R-IN? 75
END-F? 5E6
REJ-F? 7.5E6
REJ-LOSS(DB)? 20
RPL? .5
  N=5    REJ=26
  C1=7.239730803E-10
  L2=2.935477964E-06
  C3=1.078383348E-09
  L4=2.935477964E-06
  C5=7.239730803E-10
  PROGRAM COMPLETE
```

Schematic *Filter Component Designations*



Program *Filter Component Values*

```
P0:   938 STEPS
50    INP "BUTWTH OR CHEB",$
60    IF MID(1,1)="B" THEN 3000
85    INP "HI OR LOWPASS",$
100   INP "R-IN",R,"END-F",U,"REJ-F",V,"REJ-LOSS
      (DB)",A,"RPL",T
104   IF MID(1,1)="H" THEN 108
106   V=V/U:GOTO 110
108   V=U/V
110   GSB 1000
130   PRT "N=",N,"   REJ=",INT C
140   FOR K=1 TO N:GSB 2000
145   IF Q=1;G=(1/G)
150   IF FRAC (K/2)≠0;PRT "C";K;"=";((1/R)/(2*π*U))*G
160   IF FRAC (K/2)=0;PRT "L";K;"=";(R/(2*π*U))*G
170   NEXT K
180   PRT "PROGRAM COMPLETE":END
1000  MODE 5:N=3
1010  D=(HCS (N*AHC (V)))*(HCS (N*AHC (V)))
1020  C=10*LOG (1+((10↑(T/10))-1)*D)
1030  IF C > A THEN 1050
1040  N=N+2:GOTO 1010
1050  RET
2000  MODE 5:J=LN (1/(HTN (T/17.37)))
2010  Y=HSN (J/(2*N))
2015  Z=SIN ((((2*K)-1)*π)/(2*N))
2020  B=Y↑2+SIN ((K*π)/N)*SIN ((K*π)/N)
2030  IF K=1 THEN 2050
2040  G=((4*X)*Z)/(W*S):GOTO 2060
2050  G=(2*Z)/Y
2060  X=Z:W=B:S=G
2070  RET
3000  INP "HI OR LOWPASS",$
3010  INP "R-IN",R,"3DB-F",U,"REJ-F",V,"REJ-LOSS
      (DB)",A
3014  IF MID(1,1)="H";V=U/V:GOTO 3020
3016  V=V/U
3020  GSB 4000
3030  PRT "N=";N;"   LOSS=";INT (C+.5)
3040  FOR K=1 TO N:GSB 5000
3045  IF Q=1;G=(1/G)
3050  IF FRAC (K/2)≠0;PRT "C";K;"=";((1/R)/(2*π*U))*G
3060  IF FRAC (K/2)=0;PRT "L";K;"=";(R/(2*π*U))*G
3070  NEXT K
3080  GOTO 180
4000  N=3
4010  C=10*LOG (1+V↑(2*N))
4020  IF C > A THEN 4040
4030  N=N+2:GOTO 4010
4040  RET
5000  MODE 5
5010  G=2*SIN ((((2*K)-1)*π)/(2*N))
5020  RET
```

PROGRAM YIELDS PHASES OF THE MOON

Input any date (month/day/year) and this program outputs the phase of the moon on that date. If the moon is not at any exact quarter phase (such as full, new, first quarter and so forth) then the program indicates the number of days into the lunar cycle.

The program is accurate for dates between March 1, 1900 and February 28, 2100. Starting with a lunar time of 14.60 days on March 1, 1900, this program adds 29.53059167 days for each lunar period. Need to know if there was a full moon when you were born... married... first became a computer programmer?!

Program submitted by: *Emerich Auersbacher, 41 King Street, Apt. 2, Belleville, NJ 07109.*

Program *Moon Phases*

```
10  CLEAR:BEEP 1:PAUSE "MOON PHASE CALCULATOR"
20  W=694098,X=29.53059167,Z=365.25:USING
30  BEEP 1:PAUSE "DATE IN QUESTION >> --> "
40  INPUT "MONTH:";M,"DAY:";D,"YEAR:";Y:IF Y < 100
    LET Y=1900+Y
50  IF M <= 2 LET S=((INT(30.6*(M+13))+INT(Z*(Y-1))+
    D-W)+14.6)/X:S=S-INT S:S=INT(SX+1):GOTO 70
60  S=((INT(30.6*(M+1))+INT(Z*Y)+D-W)+14.6)/X:S=S-
    INT S:S=INT(SX+1)
65  BEEP 1
70  IF (S=0)+(S=1)+(S=29)+(S=30) > 0 PRINT "PHASE:
    FULL MOON":GOTO 110
80  IF (S=14)+(S=15)+(S=16) > 0 PRINT "PHASE: NEW
    MOON":GOTO 110
90  IF (S=6)+(S=7)+(S=8) > 0 PRINT "PHASE: LAST
    QUARTER":GOTO 110
100 IF (S=21)+(S=22)+(S=23) > 0 PRINT "PHASE: FIRST
    QUARTER"
110 PRINT "CYCLE IS ";S;"DAYS INTO 30"
120 GOTO 30
```

PUTTING SOFTKEYS UNDER PROGRAM CONTROL

The softkeys on the new Sharp PC-1500 make selecting a particular program or routine the simple matter of pressing a single key. These keys can also be given labels that appear on the display. Using the label recall key a user can be reminded of the function of each key.

In normal use, the softkeys execute a programmed operation only when the PC is in the "executive" mode. That is, when the unit is not in the BUSY condition. Also, in order to see the softkey labels, it is necessary to first press the RCL key. Thus, while it is possible to construct a multi-part program and use the labeled softkeys as a menu selector, it is necessary to end each segment to return to the executive, have the user press the RCL key to bring up the softkeys menu and then punch the appropriate softkey.

However, putting the softkeys under program control makes it possible to display a menu and use the softkeys to direct program operation without ever returning to the executive mode. The accompanying listing illustrates how this can be accomplished.

Line 7000 presents a menu on the display.

Line 7010 uses the INKEY$ function to examine the keyboard.

Line 7020 extracts the ASCII code for the key that has been pressed. It ignores all key codes outside the range (17 – 22) used by the softkeys.

Line 7030 subtracts 16 from the ASCII code of a softkey to leave a number in the range 1 to 6. This number then directs the ON...GOTO statement to the appropriate section of the program.

This routine can be implemented as a subroutine if desired. Just append a RETURN statement and change the directed GOTO statement to an ON...GOSUB directive.

Now a program can be kept entirely under programmed operation, menus will automatically be displayed as required and a single stroke of a softkey will take the user to the appropriate program section.

Program *Program Control of Softkeys*

```
7000 WAIT 0:PRINT "LB1  LB2  LB3  LB4  LB5  LB6"
7010 X$=INKEY$:IF X$="" GOTO 7010
7020 X=ASC(X$):IF (X < 17)+(X > 22) THEN 7100
7030 X=X-17:ON X GOTO 1000,2000,3000,4000,5000,6000
```

FROM THE WATCH POCKET

I attended the **7th West Coast Computer Faire** in San Francisco this past month -- hoping to see the latest in PC wares. The only exhibitor in the PC department was a representative of **Quasar** showing (and selling) their HHC. I'l have more to say about the Quasar unit in a later issue. It is exactly the same machine as the Panasonic HHC which *David Motto* seems favorably impressed with as noted in this issue.

After over a month of extensive use of the Sharp PC-1500, my judgement is that it is a fine machine for the money. Fact is, I have yet to find a PC-1500 owner who is not basically pleased (or delighted!) with the unit. 4K memory expansion modules — kicking the PC to 6K — are already available in the U.S. and the 8K modules are due here by early April. The modules seem a little high priced ($150.00 for the 8K unit), but I could sure use 10K (total) in my PC!

Radio Shack is reported to be planning to start selling their PC-2 (equivalent to the Sharp PC-1500) in May.

If you don't want to wait until then, the Sharp PC-1500 is available through a number of U.S. outlets. *Bob Hall* reports good service from **Tam's, Inc.**, *14932 Garfield Avenue, Paramount, CA 90723.* They take phone orders at 800-421-5188 and have the PC-1500 listed at $249.95, the CE-150 at $199.95 and the CE-151 (4k memory plug-in) at $64.95. On the east coast, **Atlantic NorthEast Marketing**, *PO Box 921, Marblehead, MA 01945*, phone 617-639-0285, has a few interesting offers. If you buy a new PC-1500 and the CE-150 printer/plotter/cassette interface, you can trade in a Sharp PC-1211 or Radio Shack PC-1 (in working condition) for $80.00 credit. On the other hand, if you are looking to pick up some used (but guaranteed to be in good working condition) PC-1211s and PC-1s and associated equipment, *Mort Rosenstein* says they have a good stock available. Call for prices and details. He (Mort) also says the PC-1500 Service Manual with all the technical details will be available shortly for $10.00.

Send a self-addressed stamped envelope to **Walt Moffett**, *Box 1108, Sebastopol, CA 95472*, if you are interested in obtaining printed templates for your PC. He has a printing machine with just the right size characters. In addition to having several "standardized" versions available, he says he can make custom templates too.

The April issue of **BYTE Magazine** features a new pocket-sized telecomputing terminal from a new outfit called **IXO, Incorporated.** A lot of human-factors engineering reportedly went into the terminal which contains a built-in modem, system-connect protocol software, a 1K user RAM buffer and color-coded keyboard. Things are really starting to pop in the PC world! — *Nat Wadsworth, Editor*

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